

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Patent Application of

Bernd WENDEROTH et al.

Atty. Ref.: 3557-43

Serial No. 10/536,806

TC/A.U.: 1796

Filed: May 27, 2005

Examiner: OGDEN JR, Necholus

For: COOLANT BASED ON AZOLE DERIVATIVES CONTAINING 1,3-

PROPANEDIOL FOR FUEL CELL COOLING SYSTEMS

* * * * *

November 12, 2008

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

Appellant hereby **appeals** to the Board of Patent Appeals and Interferences from the last decision of the Examiner.

TABLE OF CONTENTS

(I)	REAL PARTY IN INTEREST	3
(II)	RELATED APPEALS AND INTERFERENCES	4
(III)	STATUS OF CLAIMS.....	5
(IV)	STATUS OF AMENDMENTS.....	6
(V)	SUMMARY OF CLAIMED SUBJECT MATTER.....	7
(VI)	GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL.....	10
(VII)	ARGUMENT.....	11
(VIII)	CLAIMS APPENDIX	17
(IX)	EVIDENCE APPENDIX	19
(X)	RELATED PROCEEDINGS APPENDIX	20

(I) REAL PARTY IN INTEREST

The real party in interest is BASF Aktiengesellschaft, a corporation of the country of Germany.

(II) RELATED APPEALS AND INTERFERENCES

The appellant, the undersigned, and the assignee are not aware of any related appeals, interferences, or judicial proceedings (past or present), which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

(III) STATUS OF CLAIMS

Claims 1-6 are pending and have been rejected. No claims have been substantively allowed. Claim 7 has been canceled. The rejections of claims 1-6 are being appealed.

(IV) STATUS OF AMENDMENTS

No amendments have been filed since the date of the Final Office Action of June 12, 2008.

(V) SUMMARY OF CLAIMED SUBJECT MATTER

In this section and throughout the brief, page/column and line numbers are cited in the format of "page/column:line(s)"; for example, a citation to lines 20 to 25 on page 1 of the specification would appear as "(Specification at 1:20-25.)."

In an aspect, the invention of the claims relates to an antifreeze concentrate for cooling systems in fuel cell drives.

Independent claim 1 relates to an antifreeze concentrate for cooling systems in fuel cell drives, from which ready-to-use aqueous coolant compositions having a conductivity of not more than 10 $\mu\text{S}/\text{cm}$. (*See, e.g.*, Specification at 5:14-18.) The aqueous coolant composition comprises (a) from 10 to 90% by weight of 1,3-propanediol or mixtures of 1,3-propanediol with alkylene glycols and/or derivates thereof. (*See, e.g.*, *id.* at 4:21-22.) The aqueous coolant composition comprises (b) from 90 to 10% by weight of water. (*See, e.g.*, *id.* at 4:24.) The aqueous coolant composition comprises (c) from 0.005 to 5% by weight of one or more five-membered heterocyclic compounds (azole derivatives) having 2 or 3 hetero atoms from the group consisting of nitrogen and sulfur, which contain no sulfur atom or not more than one sulfur atom and which may carry an aromatic or saturated six-membered fused moiety. (*See, e.g.*, *id.* at 4:26-27 & 2:29-34.) The aqueous coolant composition comprises (d) ortho-silicic esters. (*See, e.g.*, *id.* at 4:29.) The aqueous coolant composition is also diluted with ion-free water. (*See, e.g.*, *id.* at 4:31.)

Dependent claim 2 relates to an antifreeze concentrate for cooling systems in fuel cell drives as claimed in claim 1, containing altogether from 0.05 to 5% by weight of the azole derivatives. (*See, e.g.*, *id.* at 2:35.) Dependent claim 3 relates to an antifreeze

concentrate for cooling systems in fuel cell drives as claimed in claim 1, containing, as azole derivatives, benzimidazole, benzotriazole, tolutriazole, 1H-1,2,4-triazole and/or hydrogenated tolutriazole. (*See, e.g., id.* at 4:4-5.) Dependent claim 4 relates to an antifreeze concentrate for cooling systems in fuel cell drives as claimed in claim 1, ortho-silicic esters are present in an amount such that the ready-to-use aqueous coolant compositions have a silicon content of from 2 to 2000 ppm by weight result. (*See, e.g., id.* at 4:14-16.)

Dependent claim 5 relates to a ready-to-use aqueous coolant composition for cooling systems in fuel cell drives. The aqueous coolant composition comprises (a) from 10 to 90% by weight of 1,3-propanediol or mixtures of 1,3-propanediol with alkylene glycols and/or derivatives thereof. (*See, e.g., id.* at 4:21-22.) The aqueous coolant composition comprises (b) from 90 to 10% by weight of water. (*See, e.g., id.* at 4:24.) The aqueous coolant composition comprises (c) from 0.005 to 5% by weight of the azole derivatives. (*See, e.g., id.* at 4:26-27.) The aqueous coolant composition comprises (d) ortho-silicic esters. (*See, e.g., id.* at 4:29.) The aqueous coolant composition is obtainable by dilution of an antifreeze concentrate as claimed in any of claims 1 to 4 with ion-free water. (*See, e.g., id.* at 4:31.)

In an aspect, the invention of the claims relates to a method of cooling fuel cell drives comprising adding an antifreeze concentrate to a cooling system in a fuel cell drive.

Independent claim 6 relates to a method of cooling fuel cell drives comprising adding to a cooling system of a fuel cell drive an antifreeze concentrate. (*See, e.g., id.* at 6:14-16.) The antifreeze composition comprises of 1,3-propanediol or mixtures of 1,3-

Bernd WENDEROTH et al.

Serial No. 10/536,806

propanediol with alkylene glycols and/or derivates thereof, one or more five-membered heterocyclic compound (azole derivatives) having 2 or 3 hetero atoms which are selected from the group consisting of nitrogen and sulfur, and which contain no sulfur atom or not more than one sulfur atom and which may carry an aromatic or saturated six-membered fused moiety, and ortho-silicic esters. (*See, e.g., id. at 4:17-31 & 2:29-34.*) The method further comprises adding to the cooling system a ready-to-use aqueous coolant composition which comprises the antifreeze concentrate and has a conductivity of not more than 10 μ S/cm. (*See, e.g., id. at 5:14-18.*)

(VI) GROUNDΣ OF REJECTION TO BE REVIEWED ON APPEAL

Applicants appeal the rejection of claims 1-6 as allegedly obvious under 35 U.S.C. § 103 over U.S. Patent No. 6,818,146 to Eaton et al. (Eaton) in light of PCT Pub. No. WO 02/055630 (PCT '630) and over PCT Pub. No. WO 02/055759 (PCT '759) in light of PCT '630.

(VII) ARGUMENT

The Examiner rejected claims 1-6 for obviousness. Specifically, all pending claims were rejected under 35 U.S.C. § 103 as allegedly obvious over U.S. Patent No. 6,818,146 to Eaton et al. (Eaton) in light of PCT Pub. No. WO 02/055630 (PCT '630) and over PCT Pub. No. WO 02/055759 (PCT '759) in light of PCT '630. Applicants respectfully request reversal of these rejections, at least because there is evidence showing that the claimed invention has unexpected results and superior properties when compared with the cited prior art.

The rejection of claims 1-6 may be treated as a group. The Board may select claim 1 from that group to decide the appeal with respect to these grounds of rejection.

The Final Rejection finds the individual components in various prior art documents, cobbles them together in accordance with the claimed invention, and – importantly – ignores the unexpected and plainly superior results and properties of the presently claimed inventions. Applicants do not dispute that the individual components were extant at the time the application was filed. (For example, the reference common to both obviousness rejections – PCT '630 – is cited in the Specification at 2:1-2.)

Applicants do not claim to have invented the individual components; rather, Applicants' unique combination has been found to substantially increase "the duration of a low electrical conductivity in a cooling system." (Specification at 2:20-21 (emphasis added).) This is an important property because "[a] principal problem in the case of cooling systems in fuel cell drives is the maintenance of a low electrical conductivity of the coolant, in order to ensure reliable and trouble-free operation of the fuel cell and permanently to prevent short-circuits and corrosion." (*Id.* at 2:16-18 (emphasis added).)

Maintaining a low electrical conductivity "has the advantage that the time intervals between two coolant changes in fuel cell drives can be further extended, which is of interest in particular in the automotive sector." (*Id.* at 2:23-25.) That is, maintaining a low electrical conductivity over time – as the presently claimed invention does – decreases the frequency of replacing coolant in fuel cells.

In accordance with embodiments of this invention, an initial conductivity may be "kept at [an initially] low level during continuous operation of the fuel cell drive over several weeks or months" (*Id.* at 5:16-17.) The examples, for instance, "show that, even after a test duration of 28 days, virtually no increase in the electrical conductivity was observable in the novel examples 1 and 2 within the standard deviation since the beginning of the test." (*Id.* at 7:6-9.) The examples, furthermore, compare an extremely similar example from the prior art:

Example 1	60% by vol. of 1,3-propanediol 40% by vol. of water 0.1% by wt. of benzotriazole
Example 2	60% by vol. of 1,3-propanediol 40% by vol. of water 0.1% by wt. of benzotriazole 742 ppm by wt. of tetraethoxysilane
Comparative Example from German Patent Application No. 101 28 530.2	60% by vol. of monoethylene glycol 40% by vol. of water 0.1% by wt. of benzotriazole 742 ppm by wt. of tetraethoxysilane

(Adapted from Table 1 at 8.)

These examples and comparative examples show that the inventive compositions have unexpected results relating to the longevity and duration of the low electrical conductivity:

	Initial	After 7 Days	After 14 Days	After 21 Days	After 28 Days
Example 1	2.9 $\mu\text{S}/\text{cm}$	3.4 $\mu\text{S}/\text{cm}$	3.4 $\mu\text{S}/\text{cm}$	3.5 $\mu\text{S}/\text{cm}$	3.3 $\mu\text{S}/\text{cm}$
Example 2	3.4 $\mu\text{S}/\text{cm}$	3.3 $\mu\text{S}/\text{cm}$	3.1 $\mu\text{S}/\text{cm}$	3.3 $\mu\text{S}/\text{cm}$	2.8 $\mu\text{S}/\text{cm}$
Comparative Example	3.2 $\mu\text{S}/\text{cm}$	5.6 $\mu\text{S}/\text{cm}$	5.2 $\mu\text{S}/\text{cm}$		6.9 $\mu\text{S}/\text{cm}$

(Adapted from Table 1 at 8.)

As shown, the two exemplary compositions have a substantially constant electrical conductivity over 28 days (2.9 $\mu\text{S}/\text{cm}$ to 3.3 $\mu\text{S}/\text{cm}$; 3.4 $\mu\text{S}/\text{cm}$ to 2.8 $\mu\text{S}/\text{cm}$), whereas the comparative example's electrical conductivity increases markedly (3.3 $\mu\text{S}/\text{cm}$ to 6.9 $\mu\text{S}/\text{cm}$). The cited prior art references fare no better than the comparative example.

The cited references either do not disclose or disclose the very opposite of this aspect of the inventive subject matter, which relates to the longevity and durability of the low electrical conductivity. More specifically, the electrical conductivity of the compositions within the scope of the inventive subject matter does not substantially deteriorate over 28 days. This objective evidence disproving obviousness cannot be ignored. *See, e.g., In re Sullivan*, 498 F.3d 1345, 1353 (Fed. Cir. 2007). Furthermore, the mere fact that the data establishing the nonobviousness of the claimed subject matter appear in the specification rather than having been submitted in a declaration is irrelevant. *See, e.g., In re Soni*, 54 F.3d 746, 750 (Fed. Cir. 1995) (stating that "the PTO must consider comparative data in the specification in determining whether the claimed invention provides unexpected results); see also In re Margolis, 785 F.2d 1029, 1031 (Fed.Cir.1986).

The cited prior art teaches away from this beneficial property or provides no guidance whatsoever for obtaining a substantially constant electrical conductivity over

time. For instance, Table 6 of Eaton shows an increase in conductivity from 9 to 14 $\mu\text{mhos/Cm}$ between 10 days and 30 days. (Eaton at 10:3.) Furthermore, neither PCT '759 nor PCT '630 disclose a relatively constant conductivity over time. PCT '630, for example, discloses examples in which the electrical conductivity (i) increases from 0.8 to 3.0 $\mu\text{S/cm}$ between 7 and 42 days and (ii) increases from 2.2 to 14.4 $\mu\text{S/cm}$ between 7 and 42 days. (PCT '630 at 7:17-23.) It is notable that both sets of obviousness rejections are based on combinations of PCT '630. That is, there is nothing of record that would support a finding that the prior art necessarily and inherently has the unexpected properties and results as noted in the present application.

The Final Office Action states that "applicant's showing in Table 1 does little to distinguish the claimed invention [from] the prior art of record. First, applicant does not compare the invention against the prior art of record wherein a clear distinction could be made. Secondly, the examiner asserts that low conductivity amongst fuel cells has already been disclosed in Eaton '146 at column 10, lines 57-63 and WO '759 at page 9, lines 21-25 and Tables 6 & 7, which states that compositions having greater than 250 kOhm-cm are desired to formulate fuel cell coolants to comprise a low conductivity. . . . Therefore, nothing is seen unexpected by providing fuel cell coolant compositions with low conductivity of less than 10 [μS]/cm since the prior art of record teaches known ingredients that aid in establishing fuel cell coolants with conductivity of less than 5 [μS]/cm." (Final Office Action dated June 6, 2008, at 4.)

Both reasons for dismissing the data in Applicants' specification rest on erroneous grounds. Taking the second point first, it is not merely that Applicants' invention has a low electrical conductivity as defined in the claims. Rather, it is the unexpected result

that the low electrical conductivity remains substantially constant over time (as set forth in the examples). That is, the Examiner apparently does not appreciate that the unexpected results relate to the longevity and duration of the low conductivity and not merely the initially low electrical conductivity shown in the prior art. As Table 1 shows, the two tested compositions within the scope of the pending claims have a relatively constant electrical conductivity over 28 days. The comparative example, however, shows a marked increase over the same time period.

With respect to the Examiner's first point, it is unclear why the data in the specification, which as noted above compares a very similar composition, is not sufficient. Eaton, for example, expressly teaches away from a substantially constant electrical conductivity. Eaton's Table 6 shows an increase in conductivity from 9 to 14 $\mu\text{mhos}/\text{Cm}$ between 10 days and 30 days. (Eaton at 10:3.) Eaton's disclosure is not an isolated event; test data in the specification and the prior art all show an increase in electrical conductivity for the closest non-inventive compositions. And Eaton and PCT '630 both show that a relatively constant conductivity is unexpected and strong objective evidence of the nonobviousness of the claimed subject matter. Further testing is simply unnecessary and is duplicative over the evidence already of record.

The electrical conductivity of embodiments of the presently claimed subject matter remain relatively constant during operation of the fuel cell over time. This objective indicia of nonobviousness shows, at a minimum, an unexpected result over the cited prior art. Even assuming, *arguendo*, that the Patent Office has set forth a proper *prima facie case* of obviousness by merely finding individualized disclosures of particular portions of the claimed subject matter and piecing those disclosures together, there is nothing that

Bernd WENDEROTH et al.

Serial No. 10/536,806

even hints that an ordinarily skilled artisan would expect the beneficial properties of the pending subject matter. The prior art, in fact, suggests the very opposite.

CONCLUSION

In conclusion it is believed that the application is in clear condition for allowance; therefore, early reversal of the Final Rejection and passage of the subject application to issue are earnestly solicited.

Respectfully submitted,

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(VIII) CLAIMS APPENDIX

1. An antifreeze concentrate for cooling systems in fuel cell drives, from which ready-to-use aqueous coolant compositions having a conductivity of not more than 10 µS/cm, which comprise
 - (a) from 10 to 90% by weight of 1,3-propanediol or mixtures of 1,3-propanediol with alkylene glycols and/or derivates thereof,
 - (b) from 90 to 10% by weight of water,
 - (c) from 0.005 to 5% by weight of one or more five-membered heterocyclic compounds (azole derivatives) having 2 or 3 hetero atoms from the group consisting of nitrogen and sulfur, which contain no sulfur atom or not more than one sulfur atom and which may carry an aromatic or saturated six-membered fused moiety and
 - (d) ortho-silicic esters,result by dilution with ion-free water.
2. An antifreeze concentrate for cooling systems in fuel cell drives as claimed in claim 1, containing altogether from 0.05 to 5% by weight of the azole derivatives.
3. An antifreeze concentrate for cooling systems in fuel cell drives as claimed in claim 1, containing, as azole derivatives, benzimidazole, benzotriazole, tolutriazole, 1H-1,2,4-triazole and/or hydrogenated tolutriazole.
4. An antifreeze concentrate for cooling systems in fuel cell drives as claimed in claim 1, ortho-silicic esters are present in an amount such that the ready-to-use aqueous coolant compositions have a silicon content of from 2 to 2 000 ppm by weight result.

5. A ready-to-use aqueous coolant composition for cooling systems in fuel cell drives, which comprises:

- (a) from 10 to 90% by weight of 1,3-propanediol or mixtures of 1,3-propanediol with alkylene glycols and/or derivatives thereof,
 - (b) from 90 to 10% by weight of water,
 - (c) from 0.005 to 5% by weight of the azole derivatives, and
 - (d) ortho-silicic esters,
- obtainable by dilution of an antifreeze concentrate as claimed in any of claims 1 to 4 with ion-free water.

6. A method of cooling fuel cell drives comprising adding to a cooling system of a fuel cell drive an antifreeze concentrate comprised of 1,3-propanediol or mixtures of 1,3-propanediol with alkylene glycols and/or derivatives thereof, one or more five-membered heterocyclic compound (azole derivatives) having 2 or 3 hetero atoms which are selected from the group consisting of nitrogen and sulfur, and which contain no sulfur atom or not more than one sulfur atom and which may carry an aromatic or saturated six-membered fused moiety, and ortho-silicic esters, and further comprising adding to the cooling system a ready-to-use aqueous coolant composition which comprises the antifreeze concentrate and has a conductivity of not more than 10 $\mu\text{S}/\text{cm}$.

(IX) EVIDENCE APPENDIX

(None.)

(X) RELATED PROCEEDINGS APPENDIX

(None.)